

NAME _____ CLASS _____ SECTION _____

ENGINE REPAIR (A1)

For every task in Engine Repair the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

| NATEF Task List | Task Page | Date Completed | Instructor OK |
|---|--|----------------|---------------|
| A. General Engine Diagnosis; Removal and Reinstallation (R & R) | | | |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. (P-1) | 6 | | |
| 2. Identify and interpret engine concern; determine necessary action. (P-1) | 45, 65 | | |
| 3. Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins. (P-1) | 25-29, 41-42, 47, 57, 63, 84, 93, 100, 105 | | |
| 4. Locate and interpret vehicle and major component identification numbers. (P-1) | 1, 24, 39, 40, 43 | | |
| 5. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. (P-1) | 66, 67 | | |
| 6. Diagnose engine noises and vibrations; determine necessary action. (P-2) | 68 | | |
| 7. Diagnose the cause of excessive oil consumption, unusual engine exhaust color and odor; determine necessary action. (P-2) | 32, 69 | | |
| 8. Perform engine vacuum tests; determine necessary action. (P-1) | 70 | | |
| 9. Perform cylinder power balance tests; determine necessary action. (P-2) | 71 | | |
| 10. Perform cylinder cranking and running compression tests; determine necessary action. (P-1) | 72 | | |

| | | | |
|---|----------------|--|--|
| 11. Perform cylinder leakage tests; determine necessary action. (P-1) | 73 | | |
| 12. Remove and reinstall engine in an OBD II or newer vehicle; reconnect all attaching components and restore the vehicle to running condition. (P-2) | 77, 118 | | |
| 13. Install engine covers using gaskets, seals, and sealers as required. (P-1) | 116 | | |
| 14. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. (P-2) | 11, 82 | | |
| 15. Inspect, remove, and replace engine mounts. (P-2) | 78 | | |
| B. Cylinder Head and Valve Train Diagnosis and Repair | | | |
| 1. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures. (P-1) | 79, 83 | | |
| 2. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition. (P-1) | 85, 88 | | |
| 3. Inspect valve springs for squareness and free height comparison; determine necessary action. (P-3) | 86, 89 | | |
| 4. Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine necessary action. (P-3) | 90 | | |
| 5. Inspect valve guides for wear; check valve stem-to-guide clearance; determine necessary action. (P-3) | 87 | | |
| 6. Inspect valves and valve seats; determine necessary action. (P-3) | 91 | | |
| 7. Check valve spring assembled height and valve stem height; determine necessary action. (P-3) | 92 | | |
| 8. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action. (P-2) | 94 | | |
| 9. Inspect valve lifters; determine necessary action. (P-2) | 95 | | |
| 10. Adjust valves (mechanical or hydraulic lifters). (P-1) | 96 | | |
| 11. Inspect and replace camshaft and drive belt/chain (includes checking drive gear wear and backlash, | 76 | | |

| | | | |
|---|----------------|--|--|
| end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and variable valve timing components). (P-2) | | | |
| 12. Inspect and/or measure camshaft for runout, journal wear and lobe wear. (P-2) | 97 | | |
| 13. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine necessary action. (P-2) | 98, 111 | | |
| 14. Establish camshaft position sensor indexing. (P-1) | 99 | | |
| C. Engine Block Assembly Diagnosis and Repair | | | |
| 1. Disassemble engine block; clean and prepare components for inspection and reassembly. (P-1) | 80 | | |
| 2. Inspect engine block for visible cracks, passage condition, core, and gallery plug condition, and surface warpage; determine necessary action. (P-2) | 83, 106 | | |
| 3. Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine necessary action. (P-2) | 81, 107 | | |
| 4. Deglaze and clean cylinder walls. (P-2) | 108 | | |
| 5. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action. (P-3) | 109 | | |
| 6. Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine necessary action. (P-1) | 112 | | |
| 7. Inspect main and connecting rod bearings for damage and wear; determine necessary action. (P-2) | 113 | | |
| 8. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine necessary action. (P-3) | 101 | | |
| 9. Inspect and measure piston skirts and ring lands; determine necessary action. (P-2) | 102 | | |
| 10. Remove and replace piston pin. (P-3) | 103 | | |
| 11. Determine piston-to-bore clearance. (P-2) | 110 | | |
| 12. Inspect, measure, and install piston rings. (P-2) | 104 | | |

| | | | |
|---|-------------------|--|--|
| 13. Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance or silencer); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time. (P-2) | 114 | | |
| 14. Remove, inspect or replace crankshaft vibration damper (harmonic balancer). (P-2) | 115 | | |
| 15. Assemble engine block. (P-1) | 117 | | |
| D. Lubrication and Cooling Systems Diagnosis and Repair | | | |
| 1. Perform oil pressure tests; determine necessary action. (P-1) | 74 | | |
| 2. Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action. (P-2) | 58 | | |
| 3. Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; determine necessary action. (P-1) | 34, 48, 49 | | |
| 4. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. (P-1) | 35, 50 | | |
| 5. Inspect and replace engine cooling and heater system hoses. (P-1) | 51 | | |
| 6. Inspect, test, and replace thermostat and gasket/seal. (P-1) | 52 | | |
| 7. Test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. (P-1) | 44 | | |
| 8. Inspect, remove, and replace water pump. (P-2) | 75 | | |
| 9. Remove and replace radiator. (P-2) | 53 | | |
| 10. Inspect, and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams (P-1) | 54 | | |
| 11. Inspect auxiliary coolers; determine necessary action. (P-3) | 59 | | |
| 12. Inspect, test, and replace oil temperature and pressure switches and sensors. (P-2) | 60 | | |
| 13. Perform oil and filter change. (P-1) | 33, 56 | | |
| 14. Identify causes of engine overheating. (P-1) | 55 | | |

NAME _____ CLASS _____ SECTION _____

AUTOMATIC TRANSMISSION AND TRANSAXLE (A2)

For every task in Automatic Transmission and Transaxle, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

| NATEF Task List | Task Page | Date Completed | Instructor OK |
|---|------------------|-----------------------|----------------------|
| A. General Transmission and Transaxle Diagnosis | | | |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. (P-1) | 6 | | |
| 2. Identify and interpret transmission/transaxle concern; differentiate between engine performance and transmission/transaxle concerns; determine necessary action. (P-1) | 436 | | |
| 3. Research applicable vehicle and service information, such as transmission/transaxle system operation, fluid type, vehicle service history, service precautions, and technical service bulletins. (P-1) | 25-29 | | |
| 4. Locate and interpret vehicle and major component identification numbers. (P-1) | 24-425 | | |
| 5. Diagnose fluid loss and condition concerns; check fluid level in transmissions with and without dipstick; determine necessary action. (P-1) | 429 | | |
| 6. Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action. (P-1) | 430 | | |
| 7. Perform stall test; determine necessary action. (P-3) | 431 | | |
| 8. Perform lock-up converter system tests; determine necessary action. (P-3) | 432 | | |
| 9. Diagnose noise and vibration concerns; determine necessary action. (P-2) | 433 | | |

| | | | |
|--|----------|--|--|
| 10. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles. (P-1) | 436 | | |
| 12. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law). (P-2) | 426 | | |
| 13. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information. (P-1) | 434 | | |
| B. In-Vehicle Transmission/Transaxle Maintenance and Repair | | | |
| 1. Inspect, adjust, and replace manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. (P-2) | 435 | | |
| 2. Inspect and replace external seals, gaskets, and bushings. (P-2) | 427, 437 | | |
| 3. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits, including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses. (P-1) | 435 | | |
| 4. Diagnose electronic transmission control systems using a scan tool; determine necessary action. (P-1) | 436 | | |
| 5. Inspect, replace, and align powertrain mounts. (P-2) | 389 | | |
| 6. Service transmission; perform visual inspection; replace fluid and filters. (P-1) | 428 | | |
| C. Off Vehicle Transmission and Transaxle Repair | | | |
| 1. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces. (P-1) | 438 | | |
| 2. Disassemble, clean, and inspect transmission/transaxle. (P-1) | 439 | | |
| 3. Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets). (P-2) | 440 | | |
| 4. Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine necessary action. (P-2) | 441 | | |
| 5. Assemble transmission/transaxle. (P-1) | 442 | | |
| 6. Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings. (P-1) | 443 | | |

| | | | |
|--|------------|--|--|
| 7. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore. (P-2) | 444 | | |
| 8. Install and seat torque converter to engage drive/splines. (P-1) | 445 | | |
| 9. Inspect, measure, and reseal oil pump assembly and components. (P-1) | 446 | | |
| 10. Measure transmission/transaxle end play or preload; determine necessary action. (P-1) | 447 | | |
| 11. Inspect, measure, and replace thrust washers and bearings. (P-2) | 448 | | |
| 12. Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls. (P-2) | 449 | | |
| 13. Inspect bushings; determine necessary action. (P-2) | 450 | | |
| 14. Inspect and measure planetary gear assembly components; determine necessary action. (P-2) | 451 | | |
| 15. Inspect case bores, passages, bushings, vents, and mating surfaces; determine necessary action. (P-2) | 452 | | |
| 16. Inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform necessary action. (P-2) | 453 | | |
| 17. Inspect, measure, repair, adjust or replace transaxle final drive components. (P-2) | 454 | | |
| 18. Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates; determine necessary action. (P-2) | 458 | | |
| 19. Measure clutch pack clearance; determine necessary action. (P-1) | 456 | | |
| 20. Air test operation of clutch and servo assemblies. (P-1) | 456 | | |
| 21. Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, and retainers; determine necessary action. (P-1) | 457 | | |
| 22. Inspect bands and drums; determine necessary action. (P-2) | 455 | | |
| 23. Describe the operational characteristics of a continuously variable transmission (CVT) (P-3) | 459 | | |
| 24. Describe the operational characteristics of a hybrid vehicle drive train. (P-3) | 460 | | |

NAME _____ CLASS _____ SECTION _____

MANUAL DRIVE TRAIN AND AXLES (A3)

For every task in Manual Drive Train and Axles, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

| NATEF Task List | Task Page | Date Completed | Instructor OK |
|--|------------------|-----------------------|----------------------|
| A. General Drive Train Diagnosis | | | |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. (P-1) | 6 | | |
| 2. Identify and interpret drive train concern; determine necessary action. (P-1) | 418 | | |
| 3. Research applicable vehicle and service information, such as drive train system operation, fluid type, vehicle service history, service precautions, and technical service bulletins. (P-1) | 25-29 | | |
| 4. Locate and interpret vehicle and major component identification numbers. (P-1) | 24 | | |
| 5. Diagnose fluid loss, level, and condition concerns; determine necessary action. (P-1) | 382 | | |
| 6. Drain and fill manual transmission/transaxle and final drive unit. (P-1) | 373 | | |
| B. Clutch Diagnosis and Repair | | | |
| 1. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action. (P-1) | 374 | | |
| 2. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action. (P-1) | 375 | | |
| 3. Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action. (P-1) | 376 | | |
| 4. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable). (P-1) | 377 | | |
| 5. Bleed clutch hydraulic system. (P-1) | 378 | | |

| | | | |
|---|------------|--|--|
| 6. Inspect flywheel and ring gear for wear and cracks; determine necessary action. (P-1) | 379 | | |
| 7. Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action. (P-1) | 380 | | |
| 8. Measure flywheel runout and crankshaft end play; determine necessary action. (P-2) | 381 | | |
| C. Transmission/Transaxle Diagnosis and Repair | | | |
| 1. Remove and reinstall transmission/transaxle.(P-1) | 384 | | |
| 2. Disassemble, clean, and reassemble transmission/transaxle components. (P-1) | 385 | | |
| 3. Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action. (P-2) | 386 | | |
| 4. Diagnose noise concerns using transmission/transaxle powerflow principles.(P-2) | 387 | | |
| 5. Diagnose hard shifting and jumping out of gear concerns; determine necessary action. (P-2) | 387 | | |
| 6. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers. (P-2) | 388 | | |
| 7. Inspect, replace, and align powertrain mounts. (P-2) | 389 | | |
| 8. Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces. (P-2) | 390 | | |
| 9. Remove and replace transaxle final drive. (P-3) | 391 | | |
| 10. Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs. (P-2) | 392 | | |
| 11. Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action. (P-1) | 393 | | |
| 12. Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings. (P-1) | 394 | | |
| 13. Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action. (P-3) | 395 | | |
| 14. Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly. (P-3) | 454 | | |

| | | | |
|--|-----|--|--|
| 15. Inspect lubrication devices (oil pump or slingers); perform necessary action. (P-3) | 396 | | |
| 16. Inspect, test, and replace transmission/transaxle sensors and switches. (P-2) | 397 | | |
| 17. Describe the operational characteristics of an electronically controlled manual transmission/transaxle. (P-3) | 398 | | |
| D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair | | | |
| 1. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action. (P-1) | 399 | | |
| 2. Diagnose universal joint noise and vibration concerns; perform necessary action. (P-2) | 399 | | |
| 3. Remove and replace front wheel drive (FWD) front wheel bearing. (P-1) | 302 | | |
| 4. Inspect, service, and replace shafts, yokes, boots, and CV joints. (P-1) | 400 | | |
| 5. Inspect, service, and replace shaft center support bearings. (P-3) | 400 | | |
| 6. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles. (P-2) | 400 | | |
| E. Drive Axle Diagnosis and Repair | | | |
| 1. Ring and Pinion Gears and Differential Case Assembly | | | |
| 1. Diagnose noise and vibration concerns; determine necessary action. (P-2) | 403 | | |
| 2. Diagnose fluid leakage concerns; determine necessary action. (P-1) | 404 | | |
| 3. Inspect and replace companion flange and pinion seal; measure companion flange runout. (P-2) | 405 | | |
| 4. Inspect ring gear and measure runout; determine necessary action. (P-2) | 406 | | |
| 5. Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings. (P-2) | 407 | | |
| 6. Measure and adjust drive pinion depth. (P-2) | 408 | | |
| 7. Measure and adjust drive pinion bearing preload. (P-2) | 409 | | |
| 8. Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types). (P-2) | 410 | | |
| 9. Check ring and pinion tooth contact patterns; perform necessary action. (P-1) | 411 | | |

| | | | |
|---|------------|--|--|
| 10. Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case. (P-2) | 412 | | |
| 11. Reassemble and reinstall differential case assembly; measure runout; determine necessary action. (P-2) | 413 | | |
| 2. Limited Slip Differential | | | |
| 1. Diagnose noise, slippage, and chatter concerns; determine necessary action. (P-3) | 414 | | |
| 2. Clean and inspect differential housing; refill with correct lubricant and/or additive. (P-2) | 415 | | |
| 3. Inspect and reinstall limited slip differential components. (P-3) | 416 | | |
| 4. Measure rotating torque; determine necessary action. (P-3) | 417 | | |
| 3. Drive Axle Shaft | | | |
| 1. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action. (P-2) | 399 | | |
| 2. Inspect and replace drive axle shaft wheel studs. (P-1) | 402 | | |
| 3. Remove and replace drive axle shafts. (P-1) | 401 | | |
| 4. Inspect and replace drive axle shaft seals, bearings, and retainers. (P-2) | 401 | | |
| 5. Measure drive axle flange runout and shaft end play; determine necessary action. (P-2) | 401 | | |

| F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair | | | |
|--|------------|--|--|
| 1. Diagnose noise, vibration, and unusual steering concerns; determine necessary action. (P-3) | 418 | | |
| 2. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. (P-3) | 419 | | |
| 3. Remove and reinstall transfer case. (P-3) | 420 | | |
| 4. Disassemble, service, and reassemble transfer case and components. (P-3) | 421 | | |
| 5. Inspect front-wheel bearings and locking hubs; perform necessary action. (P-3) | 422 | | |
| 6. Check drive assembly seals and vents; check lube level. (P-3) | 423 | | |
| 7. Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems. (P-3) | 424 | | |
| 8. Identify concerns related to variations in tire circumference and/or final drive ratios. (P-3) | 418 | | |

NAME _____ CLASS _____ SECTION _____

SUSPENSION AND STEERING (A4)

For every task in Suspension and Steering, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

| Task | Task Page | Date Completed | Instructor OK |
|--|----------------------|----------------|---------------|
| A. General Suspension and Steering Systems Diagnosis | | | |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. (P-1) | 6 | | |
| 2. Identify and interpret suspension and steering concern; determine necessary action. (P-1) | 341, 355 | | |
| 3. Research applicable vehicle and service information, such as suspension and steering system operation, vehicle service history, service precautions, and technical service bulletins. (P-1) | 25-29, 331, 340, 368 | | |
| 4. Locate and interpret vehicle and major component identification numbers (P-1) | 24 | | |
| B. Steering Systems Diagnosis and Repair | | | |
| 1. Disable and enable supplemental restraint system (SRS). (P-1) | 351 | | |
| 2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring). (P-1) | 351 | | |
| 3. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action. (P-2) | 352 | | |
| 4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. (P-2) | 359 | | |

| | | | |
|--|------------|--|--|
| 5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, noise concerns; determine necessary action. (P-2) | 359 | | |
| 6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action. (P-2) | 352 | | |
| 7. Adjust non-rack and pinion worm bearing preload and sector lash. (P-3) | 353 | | |
| 8. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets. (P-2) | 353 | | |
| 9. Inspect and replace rack and pinion steering gear inner tie rod ends (sockets) and bellows boots. (P-2) | 356 | | |
| 10. Determine proper power steering fluid type; inspect fluid level and condition. (P-1) | 360 | | |
| 11. Flush, fill, and bleed power steering system. (P-2) | 360 | | |
| 12. Diagnose power steering fluid leakage; determine necessary action. (P-2) | 361 | | |
| 13. Remove, inspect, replace, and adjust power steering pump belt. (P-1) | 362 | | |
| 14. Remove and reinstall power steering pump. (P-2) | 362 | | |
| 15. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment. (P-2) | 362 | | |
| 16. Inspect and replace power steering hoses and fittings. (P-2) | 363 | | |
| 17. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper. (P-2) | 357 | | |
| 18. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps. (P-1) | 358 | | |
| 19. Test and diagnose components of electronically controlled steering systems using a scan tool; determine necessary action. (P-3) | 364 | | |
| 20. Inspect and test electric-power assist steering. (P-3) | 365 | | |
| 21. Identify hybrid vehicle power steering system electrical circuits, service and safety precautions. (P-3) | 366 | | |

| C. Suspension Systems Diagnosis and Repair | | | |
|---|-----------------|--|--|
| 1. Diagnose short and long arm suspension system noises, body sway, and uneven riding height concerns; determine necessary action. (P-1) | 342 | | |
| 2. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action. (P-1) | 342 | | |
| 3. Remove, inspect, and install upper and lower control arms, bushings, shafts, and rebound bumpers. (P-2) | 343 | | |
| 4. Remove, inspect and install strut rods and bushings. (P-2) | 344 | | |
| 5. Remove, inspect, and install upper and/or lower ball joints. (P-1) | 343 | | |
| 6. Remove, inspect, and install steering knuckle assemblies. (P-2) | 343 | | |
| 7. Remove, inspect, and install short and long arm suspension system coil springs and spring insulators. (P-3) | 343 | | |
| 8. Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts. (P-3) | 345 | | |
| 9. Remove, inspect, and install stabilizer bar bushings, brackets, and links. (P-2) | 344 | | |
| 10. Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount. (P-1) | 346, 349 | | |
| 11. Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts. (P-3) | 348 | | |
| D. Related Suspension and Steering Service | | | |
| 1. Inspect, remove, and replace shock absorbers. (P-1) | 347, 349 | | |
| 2. Remove, inspect, and service or replace front and rear wheel bearings. (P-1) | 300 | | |
| 3. Test and diagnose components of electronically controlled suspension systems using a scan tool; determine necessary action. (P-3) | 350 | | |
| 4. Diagnose, inspect, adjust, repair or replace components of electronically controlled steering systems (including sensors, switches, and actuators); initialize system as required. (P-3) | 364 | | |
| 5. Describe the function of the idle speed compensation switch. (P-3) | 364 | | |
| 6. Lubricate suspension and steering systems. (P-2) | 37, 354 | | |

| E. Wheel Alignment Diagnosis, Adjustment, and Repair | | | |
|--|-----------------|--|--|
| 1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action. (P-1) | 367 | | |
| 2. Perform prealignment inspection and measure vehicle ride height; perform necessary action. (P-1) | 369 | | |
| 3. Prepare vehicle for wheel alignment on the alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber; and toe as required; center steering wheel. (P-1) | 370, 371 | | |
| 4. Check toe-out-on-turns (turning radius); determine necessary action. (P-2) | 372 | | |
| 5. Check SAI (steering axis inclination) and included angle; determine necessary action. (P-2) | 372 | | |
| 6. Check rear wheel thrust angle; determine necessary action. (P-1) | 373 | | |
| 7. Check for front wheel setback; determine necessary action. (P-2) | 373 | | |
| 8. Check front and/or rear cradle (subframe) alignment; determine necessary action. (P-3) | 373 | | |

| F. Wheel and Tire Diagnosis and Repair | | | |
|--|----------------|--|--|
| 1. Inspect tire condition; identify tire wear patterns; check and adjust air pressure; determine necessary action. (P-1) | 333 | | |
| 2. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action. (P-2) | 334 | | |
| 3. Rotate tires according to manufacturer's recommendations. (P-1) | 36, 335 | | |
| 4. Measure wheel, tire, axle flange, and hub runout; determine necessary action. (P-2) | 336 | | |
| 5. Diagnose tire pull (lead) problems; determine necessary action. (P-2) | 334 | | |
| 6. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic). (P-1) | 338 | | |
| 7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. (P-2) | 338 | | |
| 8. Reinstall wheel; torque lug nuts. (P-1) | 337 | | |
| 9. Inspect tire and wheel assembly for air loss; perform necessary action. (P-1) | 333 | | |
| 10. Repair tire using internal patch. (P-1) | 339 | | |
| 11. Inspect, diagnose, and calibrate tire pressure monitoring system. (P-2) | 332 | | |

NAME _____ CLASS _____ SECTION _____

BRAKES (A5)

For every task in Brakes, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

| Task | Task Page | Date Completed | Instructor OK |
|--|----------------------------|----------------|---------------|
| A. General Brake Systems Diagnosis | | | |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. (P-1) | 6 | | |
| 2. Identify and interpret brake system concern; determine necessary action. (P-1) | 284 | | |
| 3. Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins. (P-1) | 25-29, 285, 303, 307 | | |
| 4. Locate and interpret vehicle and major component identification numbers. (P-1) | 24 | | |
| B. Hydraulic System Diagnosis and Repair | | | |
| 1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law). (P-1) | 288 | | |
| 2. Measure brake pedal height, travel, and free play (as applicable); determine necessary action. (P-1) | 289 | | |
| 3. Check master cylinder for internal/external leaks and proper operation; determine necessary action. (P-1) | 290 | | |
| 4. Remove, bench bleed, and reinstall master cylinder. (P-1) | 290 | | |
| 5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action. (P-2) | 291 | | |

| | | | |
|--|------------|--|--|
| 6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action. (P-1) | 295 | | |
| 7. Replace brake lines, hoses, fittings, and supports. (P-2) | 295 | | |
| 8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types). (P-2) | 295 | | |
| 9. Select, handle, store, and fill brake fluids to proper level. (P-1) | 296 | | |
| 10. Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves. (P-3) | 292 | | |
| 11. Inspect, test, and/or replace components of brake warning light system. (P-3) | 293 | | |
| 12. Bleed and/or flush brake system. (P-1) | 297 | | |
| 13. Test brake fluid for contamination. (P-1) | 296 | | |
| C. Drum Brake Diagnosis and Repair | | | |
| 1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action. (P-1) | 304 | | |
| 2. Remove, clean, inspect, and measure brake drums; determine necessary action. (P-1) | 315 | | |
| 3. Refinish brake drum; measure final drum diameter. (P-1) | 315 | | |
| 4. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. (P-1) | 305 | | |
| 5. Inspect and install wheel cylinders. (P-2) | 305 | | |
| 6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings. (P-2) | 305 | | |
| 7. Install wheel, torque lug nuts, and make final checks and adjustments. (P-1) | 306 | | |
| D. Disc Brake Diagnosis and Repair | | | |
| 1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine necessary action. (P-1) | 308 | | |
| 2. Remove caliper assembly; inspect for leaks and damage to caliper housing; determine necessary action. (P-1) | 308 | | |

| | | | |
|--|------------|--|--|
| 3. Clean and inspect caliper mounting and slides/pins for operation, wear, and damage; determine necessary action. (P-1) | 308 | | |
| 4. Remove, inspect and replace pads and retaining hardware; determine necessary action. (P-1) | 308 | | |
| 5. Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts. (P-3) | 308 | | |
| 6. Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks. (P-1) | 308 | | |
| 7. Clean, inspect, and measure rotor thickness, lateral runout, and thickness variation; determine necessary action. (P-1) | 316 | | |
| 8. Remove and reinstall rotor. (P-1) | 316 | | |
| 9. Refinish rotor on vehicle; measure final rotor thickness. (P-1) | 316 | | |
| 10. Refinish rotor off vehicle; measure final rotor thickness. (P-1) | 316 | | |
| 11. Retract caliper piston on an integrated parking brake system. (P-1) | 311 | | |
| 12. Install wheel, torque lug nuts, and make final checks and adjustments. (P-1) | 309 | | |
| 13. Check brake pad wear indicator system operation; determine necessary action. (P-2) | 310 | | |
| E. Power Assist Units Diagnosis and Repair | | | |
| 1. Test pedal free travel; check power assist operation. (P-2) | 317 | | |
| 2. Check vacuum supply to vacuum-type power booster. (P-1) | 318 | | |
| 3. Inspect the vacuum-type power booster unit for leaks; inspect the check valve for proper operation; determine necessary action. (P-1) | 319 | | |
| 4. Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action. (P-3) | 320 | | |
| 5. Measure and adjust master cylinder pushrod length. (P-3) | 321 | | |

| F. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair | | | |
|---|-----------------|--|--|
| 1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action. (P-1) | 298 | | |
| 2. Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings. (P-1) | 299 | | |
| 3. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed. (P-2) | 312 | | |
| 4. Check parking brake and indicator light system operation; determine necessary action. (P-1) | 313 | | |
| 5. Check operation of brake stop light system; determine necessary action. (P-1) | 294, 314 | | |
| 6. Replace wheel bearing and race. (P-2) | 300 | | |
| 7. Inspect and replace wheel studs. (P-1) | 301 | | |
| 8. Remove and reinstall sealed wheel bearing assembly. (P-1) | 302 | | |
| G. Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair | | | |
| 1. Identify and inspect electronic brake control system components; determine necessary action. (P-1) | 323 | | |
| 2. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system ; determine necessary action. (P-2) | 324 | | |
| 3. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action. (P-1) | 324 | | |
| 4. Depressurize high-pressure components of the electronic brake control system. (P-3) | 325 | | |
| 5. Bleed the electronic brake control system hydraulic circuits. (P-1) | 326 | | |
| 6. Remove and install electronic brake control system electrical/electronic and hydraulic components. (P-3) | 327 | | |

| | | | |
|---|-----------------|--|--|
| 7. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data). (P-1) | 328 | | |
| 8. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). (P-3) | 329 | | |
| 9. Identify traction control/vehicle stability control system components. (P-3) | 322, 330 | | |
| 10. Describe the operation of a regenerative braking system. (P-3) | 278 | | |

NAME _____ CLASS _____ SECTION _____

ELECTRICAL/ELECTRONIC SYSTEMS (A6)

For every task in Electrical/Electronic Systems, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

| Task | Task Page | Date Completed | Instructor OK |
|--|-----------------------------|-----------------------|----------------------|
| A. General Electrical System Diagnosis | | | |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. (P-1) | 6 | | |
| 2. Identify and interpret electrical/electronic system concern; determine necessary action. (P-1) | 139, 141 | | |
| 3. Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins. (P-1) | 25-29, 146, 155, 161 | | |
| 4. Locate and interpret vehicle and major component identification numbers. (P-1) | 24 | | |
| 5. Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law). (P-1) | 121-129, 140 | | |
| 6. Use wiring diagrams during diagnosis of electrical circuit problems. (P-1) | 140 | | |
| 7. Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems, including: source voltage, voltage drop, current flow, and resistance (P-1) | 130 | | |
| 8. Check electrical circuits with a test light; determine necessary action. (P-2) | 131 | | |
| 9. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs. (P-2) | 133 | | |
| 10. Check electrical circuits using fused jumper wires; determine necessary action. (P-2) | 132 | | |

| | | | |
|---|-----------------|--|--|
| 11. Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action. (P-1) | 141 | | |
| 12. Measure and diagnose the cause(s) of excessive parasitic draw; determine necessary action. (P-1) | 147 | | |
| 13. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. (P-1) | 134 | | |
| 14. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action. (P-1) | 135, 143 | | |
| 15. Remove and replace terminal end from connector; replace connectors and terminal ends. (P-1) | 136 | | |
| 16. Repair wiring harness (including CAN/BUS systems). (P-1) | 137 | | |
| 17. Perform solder repair of electrical wiring. (P-1) | 138 | | |
| 18. Identify location of hybrid vehicle high-voltage circuit disconnect (service plug) location and safety procedures. (P-2) | 279 | | |
| B. Battery Diagnosis and Service | | | |
| 1. Perform battery state-of-charge test; determine necessary action. (P-1) | 148 | | |
| 2. Perform battery capacity test; confirm proper battery capacity for vehicle application; determine necessary action. (P-1) | 148 | | |
| 3. Maintain or restore electronic memory functions. (P-1) | 149 | | |
| 4. Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps, and hold-downs. (P-1) | 150 | | |
| 5. Perform battery charge. (P-1) | 151 | | |
| 6. Start a vehicle using jumper cables or auxiliary power supply. (P-1) | 152 | | |
| 7. Identify high voltage circuits of electric or hybrid electric vehicle and related safety precautions. (P-3) | 280, 283 | | |
| 8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry following battery disconnect. (P-1) | 153 | | |
| 9. Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures. (P-3) | 154 | | |
| C. Starting System Diagnosis and Repair | | | |
| 1. Perform starter current draw tests; determine necessary action. (P-1) | 158 | | |

| | | | |
|--|------------|--|--|
| 2. Perform starter circuit voltage drop tests; determine necessary action. (P-1) | 158 | | |
| 3. Inspect and test starter relays and solenoids; determine necessary action. (P-2) | 159 | | |
| 4. Remove and install starter in a vehicle. (P-1) | 160 | | |
| 5. Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action. (P-2) | | | |
| 6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition. (P-2) | 158 | | |
| D. Charging System Diagnosis and Repair | | | |
| 1. Perform charging system output test; determine necessary action. (P-1) | 166 | | |
| 2. Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions. (P-1) | 167 | | |
| 3. Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment. (P-1) | 168 | | |
| 4. Remove, inspect, and install generator (alternator). (P-1) | 168 | | |
| 5. Perform charging circuit voltage drop tests; determine necessary action. (P-1) | 169 | | |
| E. Lighting Systems Diagnosis and Repair | | | |
| 1. Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action. (P-1) | 170 | | |
| 2. Inspect, replace, and aim headlights and bulbs. (P-2) | 170 | | |
| 3. Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action. (P-2) | 170 | | |
| 4. Identify system voltage and safety precautions associated with high intensity discharge headlights. (P-2) | 171 | | |
| F. Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair | | | |
| 1. Inspect and test gauges and gauge sending units for cause of abnormal gauge readings; determine necessary action. (P-1) | 172 | | |
| 2. Inspect and test connectors, wires, and printed circuit boards of gauge circuits; determine necessary action. (P-3) | 173 | | |

| | | | |
|---|----------|--|--|
| 3. Diagnose the cause of incorrect operation of warning devices and other driver information systems; determine necessary action. (P-1) | 173 | | |
| 4. Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action. (P-3) | 173 | | |
| G. Horn and Wiper/Washer Diagnosis and Repair | | | |
| 1. Diagnose incorrect horn operation; perform necessary action. (P-1) | 174 | | |
| 2. Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action. (P-1) | 175 | | |
| 3. Diagnose incorrect washer operation; perform necessary action. (P-2) | 175 | | |
| H. Accessories Diagnosis and Repair | | | |
| 1. Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action. (P-1) | 177 | | |
| 2. Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action. (P-3) | 177 | | |
| 3. Diagnose incorrect electric lock operation (including remote keyless entry); determine necessary action. (P-1) | 177 | | |
| 4. Diagnose incorrect operation of cruise control systems; determine necessary action. (P-3) | 177 | | |
| 5. Diagnose supplemental restraint system (SRS) concerns; determine necessary action. (P-1) | 181 | | |
| 6. Disarm and enable the airbag system for vehicle service. (P-1) | 182 | | |
| 7. Diagnose radio static and weak, intermittent, or no radio reception; determine necessary action. (P-3) | 142, 183 | | |
| 8. Remove and reinstall door panel. (P-1) | 178 | | |
| 9. Diagnose body electronic system circuits using a scan tool; determine necessary action. (P-2) | 179 | | |
| 10. Check for module communication (including CAN/ BUS systems) errors using a scan tool. (P-2) | 179 | | |
| 11. Diagnose the cause of false, intermittent, or no operation of anti-theft systems. (P-3) | 180 | | |
| 12. Describe the operation of keyless entry/remote-start systems. (P-3) | 180 | | |
| 13. Perform software transfers, software updates, or flash reprogramming on electronic modules. (P-3) | 180 | | |

NAME _____ CLASS _____ SECTION _____

HEATING AND AIR CONDITIONING (A7)

For every task in Heating and Air Conditioning, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

| NATEF Task List | Task Page | Date Completed | Instructor OK |
|---|-------------------|-----------------------|----------------------|
| A. A/C System Diagnosis and Repair | | | |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. (P-1) | 189 | | |
| 2. Identify and interpret heating and air conditioning concern; determine necessary action. (P-1) | 206 | | |
| 3. Research applicable vehicle and service information, such as heating and air conditioning system operation, vehicle service history, service precautions, and technical service bulletins. (P-1) | 25-29, 186 | | |
| 4. Locate and interpret vehicle and major component identification numbers. (P-1) | 24, 184 | | |
| 5. Performance test A/C system; identify A/C system malfunctions. (P-1) | 190, 197 | | |
| 6. Identify abnormal operating noises in the A/C system; determine necessary action. (P-2) | 191 | | |
| 7. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings. (P-1) | 192 | | |
| 8. Leak test A/C system; determine necessary action. (P-1) | 193 | | |
| 9. Inspect the condition of refrigerant oil removed from the system; determine necessary action. (P-2) | 194 | | |
| 10. Determine recommended oil and oil capacity for system application. (P-1) | 194 | | |
| 11. Using scan tool, observe and record related HVAC data and trouble codes. (P-1) | 195 | | |

| B. Refrigeration System Component Diagnosis and Repair | | | |
|--|----------------------|--|--|
| 1. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action. (P-2) | 195 | | |
| 2. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. (P-1) | 207 | | |
| 3. Inspect, test, and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap and adjust as needed. (P-2) | 207 | | |
| 4. Remove, inspect, and reinstall A/C compressor and mountings; determine required oil quantity. (P-1) | 207 | | |
| 5. Identify hybrid vehicle A/C system electrical circuits, service and safety precautions. (P-3) | 185, 219, 282 | | |
| 6. Determine the need for an additional A/C system filter; perform necessary action. (P-3) | 196 | | |
| 7. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action. (P-2) | 207 | | |
| 8. Inspect A/C condenser for airflow restrictions; perform necessary action. (P-1) | 208 | | |
| 9. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine required oil quantity. (P-1) | 209 | | |
| 10. Remove, inspect, and install expansion valve or orifice (expansion) tube. (P-1) | 210 | | |
| 11. Inspect evaporator housing water drain; perform necessary action. (P-2) | 211 | | |
| 12. Remove, inspect, and reinstall evaporator; determine required oil quantity. (P-3) | 212 | | |
| 13. Remove, inspect, and reinstall condenser; determine required oil quantity. (P-3) | 213 | | |
| C. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair | | | |
| 1. Diagnose temperature control problems in the heater/ventilation system; determine necessary action. (P-2) | 198 | | |
| 2. Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action. (P-1) | 199 | | |
| 3. Inspect engine cooling and heater system hoses and belts; perform necessary action. (P-1) | 214 | | |

| | | | | |
|---|---|----------------|--|--|
| 4. | Inspect, test, and replace thermostat and gasket/seal. (P-1) | 52, 200 | | |
| 5. | Determine coolant condition and coolant type for vehicle application; drain and recover coolant. (P-1) | 44 | | |
| 6. | Flush system; refill system with recommended coolant; bleed system. (P-2) | 45 | | |
| 7. | Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action. (P-1) | 201 | | |
| 8. | Inspect and test electric cooling fan, fan control system and circuits; determine necessary action. (P-1) | 201 | | |
| 9. | Inspect and test heater control valve(s); perform necessary action. (P-2) | 202 | | |
| 10. | Remove, inspect, and reinstall heater core. (P-3) | 202 | | |
| D. Operating Systems and Related Controls Diagnosis and Repair | | | | |
| 1. | Diagnose malfunctions in the electrical controls of heating, ventilation, and A/C (HVAC) systems; determine necessary action. (P-2) | 187 | | |
| 2. | Inspect and test A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; perform necessary action. (P-1) | 203 | | |
| 3. | Test and diagnose A/C compressor clutch control systems; determine necessary action. (P-1) | 204 | | |
| 4. | Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action. (P-2) | 205 | | |
| 5. | Inspect and test A/C-heater control panel assembly; determine necessary action. (P-3) | 195 | | |
| 6. | Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action. (P-3) | 195 | | |
| 7. | Inspect A/C-heater ducts, doors, hoses, cabin filters and outlets; perform necessary action. (P-2) | 195 | | |
| 8. | Identify the source of A/C system odors. (P-2) | 195 | | |
| 9. | Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action. (P-2) | 188 | | |

| E. Refrigerant Recovery, Recycling, and Handling | | | |
|---|------------|--|--|
| 1. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards. (P-1) | 215 | | |
| 2. Identify and recover A/C system refrigerant. (P-1) | 216 | | |
| 3. Recycle, label, and store refrigerant. (P-1) | 217 | | |
| 4. Evacuate and charge A/C system; add refrigerant oil as required. (P-1) | 218 | | |

NAME _____ CLASS _____ SECTION _____

ENGINE PERFORMANCE (A8)

For every task in Engine Performance the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

| NATEF Task List | Task Page | Date Completed | Instructor OK |
|--|---------------------------------------|-----------------------|----------------------|
| A. General Engine Diagnosis | | | |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. (P-1) | 6 | | |
| 2. Identify and interpret engine performance concern; determine necessary action. (P-1) | 46, 65 | | |
| 3. Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins. (P-1) | 25-29, 225, 226, 248, 249, 277 | | |
| 4. Locate and interpret vehicle and major component identification numbers. (P-1) | 24, 272 | | |
| 5. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. (P-2) | 38 | | |
| 6. Diagnose abnormal engine noise or vibration concerns; determine necessary action. (P-3) | 68 | | |
| 7. Diagnose abnormal exhaust color, odor, and sound; determine necessary action. (P-2) | 69 | | |
| 8. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. (P-1) | 70 | | |
| 9. Perform cylinder power balance test; determine necessary action. (P-2) | 71 | | |
| 10. Perform cylinder cranking and running compression tests; determine necessary action. (P-1) | 72 | | |
| 11. Perform cylinder leakage test; determine necessary action. (P-1) | 73 | | |

| | | | |
|---|-----------------|--|--|
| 12. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action. (P-1) | 276 | | |
| 13. Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action. (P-3) | 256 | | |
| 14. Verify engine operating temperature; determine necessary action. (P-1) | 49 | | |
| 15. Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action. (P-1) | 48 | | |
| 16. Verify correct camshaft timing. (P-1) | 99 | | |
| B. Computerized Engine Controls Diagnosis and Repair | | | |
| 1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. (P-1) | 250 | | |
| 2. Diagnose the causes of emissions or driveability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data. (P-1) | 273, 276 | | |
| 3. Diagnose emissions or driveability concerns without stored diagnostic trouble codes; determine necessary action. (P-1) | 251 | | |
| 4. Check for module communication (including CAN/BUS systems) errors using a scan tool. (P-2) | 146, 276 | | |
| 5. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action. (P-1) | 251 | | |
| 6. Access and use service information to perform step-by-step diagnosis. (P-1) | 145, 276 | | |
| 7. Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, or similar systems); determine necessary action. (P-3) | 237-243 | | |
| 8. Perform active tests of actuators using a scan tool; determine necessary action. (P-1) | 274, 275 | | |

| | | | |
|---|-----------------|--|--|
| 9. Describe the importance of running all OBDII monitors for repair verification. (P-1) | 274 | | |
| C. Ignition System Diagnosis and Repair | | | |
| 1. Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action. (P-1) | 228, 229 | | |
| 2. Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action. (P-1) | 230-233 | | |
| 3. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action. (P-1) | 234, 235 | | |
| 4. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary. (P-2) | 236 | | |
| D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair | | | |
| 1. Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action. (P-1) | 252 | | |
| 2. Check fuel for contaminants and quality; determine necessary action. (P-2) | 221 | | |
| 3. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action. (P-1) | 244, 245 | | |
| 4. Replace fuel filters. (P-2) | 245 | | |
| 5. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetereed air. (P-2) | 247 | | |
| 6. Inspect and test fuel injectors. (P-1) | 253-255 | | |
| 7. Verify idle control operation. (P-1) | 247 | | |
| 8. Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action. (P-1) | 247 | | |
| 9. Perform exhaust system back-pressure test; determine necessary action. (P-1) | 268 | | |

| | | | |
|--|----------------|--|--|
| 10. Test the operation of Turbocharger/supercharger systems; determine necessary action. (P-3) | 64 | | |
| E. Emissions Control Systems Diagnosis and Repair | | | |
| 1. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action. (P-2) | 263 | | |
| 2. Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. (P-2) | 264 | | |
| 3. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action. (P-1) | 260 | | |
| 4. Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action. (P-1) | 261 | | |
| 5. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action. (P-2) | 262 | | |
| 6. Diagnose emissions and driveability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action. (P-2) | 265 | | |
| 7. Inspect and test mechanical components of secondary air injection systems; perform necessary action. (P-3) | 266 | | |
| 8. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action. (P-3) | 268 | | |
| 9. Inspect and test catalytic converter efficiency. (P-1) | 269-271 | | |
| 10. Diagnose emissions and driveability concerns caused by the evaporative emissions control system; determine necessary action. (P-1) | 257 | | |
| 11. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action. (P-1) | 258 | | |

| | | | |
|---|------------|--|--|
| 12. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action. (P-1) | 259 | | |
| F. Engine Related Service | | | |
| 1. Adjust valves on engines with mechanical or hydraulic lifters. (P-1) | 96 | | |
| 2. Remove and replace timing belt; verify correct camshaft timing. (P-1) | 76 | | |
| 3. Remove and replace thermostat and gasket/seal. (P-1) | 52 | | |
| 4. Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action. (P-1) | 54 | | |
| 5. Perform common fastener and thread repairs, to include: remove broken bolt, restore internal and external threads, and repair internal threads with a threaded insert. (P-1) | 11 | | |
| 6. Perform engine oil and filter change. (P-1) | 56 | | |
| 7. Identify hybrid vehicle internal combustion engine service precautions. (P-3) | 281 | | |